rat intestine (Mettrick and Podesta, 1974). This may also be a useful tool in efficacy testing of anthelmintics when assessing prepatent success and temporal aspects of drug activity.

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Research Note

Helminths of Two Lizards, *Barisia imbricata* and *Gerrhonotus ophiurus* (Sauria: Anguidae), from Mexico

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ABSTRACT: The gastrointestinal tracts of 37 *Barisia imbricata* (Wiegmann) and 54 *Gerrhonotus ophiurus* Cope from Mexico were examined for helminths. The helminth fauna of *B. imbricata* consisted of 4 species of nematodes: *Cosmocercoides variabilis* (Harwood), *Oswaldocruzia pipiens* Walton, *Physaloptera retusa* Rudolphi, and *Raillietnema brachyspiculatum* Bursey, Goldberg, Salgado-Maldonado, and Méndez-de la Cruz. *Gerrhonotus ophiurus* harbored 1 trematode species, *Brachycoelium salamandrae* (Frölich), and 2 nematode species, *Cosmocercoides variabilis* and *Physaloptera retusa*. All represent new host records. With the exception of *R. brachyspiculatum*, all these helminths are generalists, which are widely distributed in other amphibian and reptile hosts.

KEY WORDS: lizards, Sauria, *Barisia imbricata*, *Gerrhonotus ophiurus*, Anguidae, Trematoda, *Brachycoelium salamandrae*, Nematoda, *Cosmocercoides variabilis*, *Oswaldocruzia pipiens*, *Physaloptera retusa*, *Raillietnema brachyspiculatum*, Mexico.

Barisia imbricata (Wiegmann, 1828) occurs in highland pine forests throughout Mexico west of the Isthmus of Tehuantepec (Good, 1988). *Gerrhonotus ophiurus* Cope, 1866, occurs in the Mexican states of Hidalgo, Puebla, San Luis Potosí, and Veracruz (Good, 1994). There are, to our knowledge, no reports of helminths from these species. We report here the helminths from populations of *B. imbricata* and *G. ophiurus*.

Thirty-seven *B. imbricata* deposited in the herpetology collection (ENEPI) of the Escuela Nacional de Estudios Profesionales Iztacala, Universidad Nacional Autónoma de México (UNAM) were examined: 23 from Estado de

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México, snout–vent length (SVL) = 104 mm ± 14.8 SD, range = 68–124 mm, ENEPI numbers 11, 12, 393, 616, 699, 730, 3873, 3874 (collected 1984–1985) and 4939, 5436, 5587–5591, 6333–6340 (collected 1990–1991); 14 from Hidalgo, SVL = 89 mm ± 20.5 SD, range = 61–123 mm, ENEPI numbers 4321, 4834–4836, 5841–5850 (collected 1990–1991). Fifty-four *G. ophiurus,* SVL = 112 mm ± 12 SD, range = 80–136 mm, were collected near San Antonio Ixtatetla, Municipio de Huayacocotla, Veracruz, (20°43′N, 98°22′W) during 1991, ENEPI numbers 6252–6262, 6264–6295, 6297–6303, 6305, 6306, 6308, 6309.

The abdominal cavities were opened and the gastrointestinal tracts were excised by cutting across the esophagus and rectum. The digestive tracts were each slit longitudinally and examined under a dissecting microscope. Each helminth was removed to a drop of undiluted glycerol on a glass slide for study; trematodes were regressively stained with hematoxylin and mounted in Canada balsam.

Because a statistically significant difference was found for the SVL between the Estado de México and Hidalgo populations of *B. imbricata* (Kruskal–Wallis test = 4.87, 1 df, $P < 0.05$) and because of community similarity differences (Jaccard's coefficient, 0.75; Morisita's index, 0.73), data for the 2 populations were not combined. The helminth fauna of the Estado de México population of *B. imbricata* consisted of 3 species of nematodes: *Cosmocercoides variabilis* (Harwood, 1930), *Oswaldocruzia pipiens* Walton, 1929, and *Raillietnema brachyspiculatum* Bursey, Goldberg, Salgado-Maldonado, and Méndez-de la Cruz, 1998. The helminth fauna of the Hidalgo population of *B. imbricata* consisted of 4 species of nematodes: *C. variabilis, O. pipiens, Physaloptera retusa* Rudolphi, 1819, and *R. brachyspiculatum.* Helminths of *G. ophiurus* consisted of 1 species of trematode, *Brachycoelium salamandrae* (Frölich, 1789), and 2 species of nematodes, *C. variabilis* and *P. retusa,* all representing new host and locality records. Terminology is in accordance with Bush et al. (1997). Representative specimens were placed in vials of 70% ethanol and deposited in the U.S. National Parasite Collection, Beltsville, Maryland (USNPC): *Barisia imbricata*: *Cosmocercoides variabilis,* USNPC 88291; *Oswaldocruzia pipiens,* USNPC 99292; *Physaloptera retusa,* USNPC 88293; *Raillietnema brachyspiculatum,* USNPC 88294. *Gerrhonotus ophiurus*: *Brachycoelium salamandrae,* USNPC 87245; *Cosmocercoides variabilis,* USNPC 87246; *Physaloptera retusa,* USNPC 87247. Helminths from *Barisia imbricata* were also deposited in the Colección Nacional de Helmintos (CNHE), Instituto de Biología de la Universidad Nacional Autónoma de México, México, Distrito Federal, Mexico: *Cosmocercoides variabilis,* CNHE 3384; *Oswaldocruzia pipiens,* CNHE 3387; *Physaloptera retusa,* CNHE 3385; *Raillietnema brachyspiculatum,* CNHE 3386.

The number of infected lizards, number of helminths, prevalence, mean intensity ± SD, and range and mean abundance ± SD are presented in Table 1. Both lizard species harbored *C. variabilis* and *P. retusa. Brachycoelium salamandrae* was found only in *G. ophiurus; O. pipiens* and *R. brachyspiculatum* were found only in *B. imbricata.*

Brachycoelium salamandrae, the only trematode species found in this study, was found in the small intestines of 2 *G. ophiurus.* There has been controversy surrounding the assignment of species to the genus *Brachycoelium.* Rankin (1938) reduced all the American species to synonymy with *B. salamandrae,* a European species and the type species of the genus. However, Parker (1941) and Cheng (1958) did not accept the synonymy and recognized 7 and 10 species of the genus, respectively. Later Cheng and Chase (1960) and Couch (1966) described additional species, bringing to 13 the number of species assigned to the genus. Prudhoe and Bray (1982) favored a monospecific genus. Regardless of confusion in the taxonomy, the specimens collected in this study most closely resemble *B. salamandrae* as described by Cheng (1958), in that they were elongate distomes, approximately 3 mm in length, more than twice the length of any other species assigned to the genus, and the vitellaria extended beyond the ceca and did not join on the midline. The North American host list for *B. salamandrae* includes salamanders, anurans, lizards, and snakes (see Prudhoe and Bray, 1982). *Gerrhonotus ophiurus* is added to this host list.

As in the case of the identity of species of *Brachyocoelium,* some uncertainty also exists for North American species of *Cosmocercoides. Cosmocercoides variabilis,* originally described as *Oxysomatium variabilis* by Harwood (1930) from *Bufo valliceps* Wiegmann, 1833, collected

Table 1. Helminths from the anguid lizards, *Barisia imbricata* and *Gerrhonotus ophiurus*, from Mexico.

Lizard species Helminth species	Number of infected lizards	Number of helminths	Prevalence (%)	Mean intensity ± SD (range)	Mean abundance ± SD
Barisia imbricata (Estado de México, $N = 23$)					
Nematoda					
Cosmocercoides variabilis	3	4	13	1.3 ± 0.6 (1–2)	0.2 ± 0.5
Oswaldocruzia pipiens	3	6	13	2.0 ± 1.7 (1–4)	0.3 ± 0.9
Raillietnema brachyspiculatum	1	83	4	83	3.6 ± 17.3
Barisia imbricata (Hidalgo, $N = 14$)					
Nematoda					
Cosmocercoides variabilis	2	6	15	3.0 ± 2.8 (1–5)	0.4 ± 1.3
Oswaldocruzia pipiens	11	86	79	7.8 ± 6.1 (1–15)	6.1 ± 6.3
Physaloptera retusa	6	18	43	3.0 ± 3.2 (1–8)	1.2 ± 2.5
Raillietnema brachyspiculatum	1	93	7	93	6.6 ± 24.9
Gerrhonotus ophiurus (Veracruz, $N = 54$)					
Trematoda					
Brachycoelium salamandrae	2	5	4	2.5 ± 2.1 (1–4)	0.1 ± 0.6
Nematoda					
Cosmocercoides variabilis	17	21	31	1.2 ± 0.6 (1–3)	0.4 ± 0.7
Physaloptera retusa	10	65	19	6.7 ± 12.0 (1–40)	1.2 ± 5.6

at Houston, Texas, was considered a synonym of the molluscan parasite *Cosmocercoides dukae* (Holl, 1928) by Ogren (1953), who presumed that amphibians acquired *C. dukae* infections by ingesting infected mollusks. *Cosmocercoides dukae* was first described by Holl (1928) from the salamander *Notophthalmus viridescens* (Rafinesque, 1820) from North Carolina. Wilkie (1930) established the genus *Cosmocercoides,* and Travassos (1931) included both *C. dukae* and *C. variabilis* in his monograph on the Cosmocercidae. Vanderburgh and Anderson (1987) demonstrated that these 2 species of *Cosmocercoides* are distinct. The major difference in the 2 species is the number of rosette papillae of the male: *C. dukae* with 12 pairs and *C. variabilis* with 14–20. Specimens collected in our study had 16–18 papillae. The host list includes salamanders, anurans, lizards, snakes, and turtles (see Baker, 1987). *Barisia imbricata* and *G. ophiurus* are added to this list.

All North American specimens of the genus *Oswaldocruzia* have been referred to *O. pipiens* by Baker (1987). This species is widely distributed in North America and has been reported from anurans, salamanders, lizards, and tortoises (see Baker, 1987). *Barisia imbricata* is added to this host list.

Physaloptera retusa is a common parasite of North American lizards (see Baker, 1987). Both *Barisia imbricata* and *G. ophiurus* are added to this host list.

Raillietnema brachyspiculatum was recently described from the xantusiid lizard, *Lepidophyma tuxtlae* Werler and Shannon, 1957, from Veracruz, Mexico, by Bursey et al. (1998). *Barisia imbricata* is a new host record, and the states of Hidalgo and México are new locality records for this nematode.

The results reported here support previous studies on North American anguids (see Goldberg et al., 1999), which have shown that lizards of this family appear to harbor depauperate communities comprised of generalist helminths. As can be seen by the host lists above, with the exception of the recently described *R. brachyspiculatum* (for which there is insufficient information to categorize), the helminth species harbored by *B. imbricata* and *G. ophiurus* are generalists. Although host lists can easily be constructed and host distributions mapped, parasite distribution patterns are more difficult to evaluate. Reasons for varying infection rates among host populations are not understood; for example, there is a significant difference between the Estado de México and Hidalgo populations of *B. imbricata* for *O. pipiens* (chi-square = 15.8, 1 df, $P < 0.001$). Additional work will be required to understand the factors influencing

prevalence patterns of helminths in anguid lizards.

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